**WE CLAIM:**

1        1.     A serial communications system comprising:

2             a scrambler for converting received data into scrambled data; and

3             an ECC encoder for converting said scrambled data into ECC-encoded data.


1        2.     The system as recited in Claim 1, further comprising:

2             a serializer for converting said ECC-encoded data into serialized data;

3             wherein the ECC-encoded data includes frame alignment information; and

4             the system further comprises a receiver for receiving said serialized data and

5  converting the serialized data into data frames based upon the frame alignment information.


1        3.     The system as recited in Claim 2, wherein the receiver comprises:

2             a frame-recoverer for converting said serialized data into data frames;

3             an ECC decoder for converting said data frames into ECC-decoded data and

4  error indications; and

5             a scrambler for converting said ECC-decoded data into de-scrambled data.


1        4.     The system as recited in Claim 5, wherein said frame-recoverer uses said error

2  indications in converting said serialized data into data frames.


1        5.     The system as recited in Claim 1, wherein said ECC encoder applies an error

2  correction code in converting said scrambled data into said ECC-encoded data.

1      6.    A serial communications method, comprising the steps of:

2            converting received data into scrambled data; and

3            converting said scrambled data into ECC-encoded data.

1      7.    The method as recited in Claim 6, further comprising the steps of:

2            generating a serial stream of the ECC-encoded data; and

3            transmitting said serial stream.

1      8.    The method of Claim 7, wherein:

2            the ECC-encoded data includes frame alignment information; and

3            the method further comprises receiving said serialized data and converting said

4  serialized data into data frames based upon said frame alignment information.

1      9.    The method of Claim 7, further comprising:

2            receiving said serialized data;

3            converting said serialized data into data frames;

4            converting said data frames into ECC-decoded data and error indications; and

5            converting said ECC-decoded data into de-scrambled data.

1      10.    The method of Claim 9, wherein the step of converting the serialized data

2  comprises converting the serialized data into data frames based upon said error indications.

1      11.    A serial communications system comprising:

2              an ECC decoder for converting data frames into ECC-decoded data; and

3              a de-scrambler for converting said ECC-decoded data into de-scrambled data.

1      12.    The system of Claim 11, further comprising a frame-recoverer for converting

2  serialized data into said data frames.

1      13.    The system as recited in Claim 12, wherein:

2              said ECC decoder generates error indications; and

3              said frame-recoverer uses said error indications in converting said serialized

4  data into said data frames.

1      14.    The system as recited in Claim 13, wherein said frame-recoverer generates a

2  frame clock that is shifted in phase based upon said error indications, said frame-recoverer

3  converting said serialized data into said data frames using said frame clock..

1      15.    The system as recited in Claim 14, wherein said frame-recoverer shifts in

2  phase said frame clock by a predetermined number of periods of a bit clock based upon said

3  error indications.

1    16.    The system as recited in Claim 13, wherein said frame-recoverer comprises:

2            a plurality of registers, each register being controlled to receive said serialized

3    data and form two or more frames of parallel data therefrom;

4            a selection control circuit for receiving said error indications and generating at

5    least one control signal; and

6            selection circuitry coupled to receive as inputs the output of said registers and

7    said control signal from said selection control circuit, and output a set of parallel data

8    appearing at the input of said selection circuitry, said number of bits in said set of parallel

9    data corresponding to the number of bits in a frame of data.


1    17.    The system as recited in claim 16, wherein

2            the selection circuitry comprises a plurality of individual multiplexer circuits,

3    the number of multiplexer circuits corresponding to the number of bits n in a frame of data,

4    each multiplexer circuit being an n+1:1 multiplexer circuit.


1    18.    The system as recited in Claim 13, wherein said error indications are

2    associated with errors in said data frames, said ECC-decoder correcting some of said errors.


1    19.    A serial communications system comprising:

2    an ECC decoder for converting data frames into ECC-decoded data and error indications; and

3            a frame recoverer for converting serialized data into said data frames using

4    said error indications.

1      20.     The system as recited in Claim 19, wherein said frame-recoverer generates a

2    frame clock that is shifted in phase based upon said error indications and converts said

3    serialized data into said data frames using said frame clock.

1      21.     The system as recited in Claim 20, wherein said frame-recoverer shifts in

2    phase said frame clock by a predetermined number of periods of a bit clock based upon said

3    error indications.

1      22.     The system as recited in Claim 19, wherein said frame-recoverer comprises:

2             a plurality of registers, each register being controlled to receive said serialized

3    data and form two or more frames of parallel data therefrom;

4             a selection control circuit for receiving said error indications and generating at least

5    one control signal; and

6             selection circuitry coupled to receive as inputs the output of said registers and

7    said control signal from said selection control circuit, and output a set of parallel data

8    appearing at the input of said selection circuitry, the number of bits in said parallel set of data

9    corresponding to the number of bits in a frame of data.

1      23.     The system as recited in claim 22, wherein

2             the selection circuitry comprises a plurality of individual multiplexer circuits,

3    the number of multiplexer circuits corresponding to the number of bits n in a frame of data,

4    each multiplexer circuit being an n+1:1 multiplexer circuit.

1     24.    The system as recited in Claim 19, wherein said error indications are

2    associated with errors in said data frames, said ECC-decoder correcting some of said errors.


1     25.    The system as recited in claim 19, further comprising:

2         a de-scrambler for converting said ECC-decoded data into de-scrambled data.


1     26.    A serial communications method comprising:

2         converting serialized data into data frames as a function of error indications;

3    and

4         converting said data frames into ECC-decoded data and said error indications.


1     27.    The method as recited in Claim 26, further comprising:

2         de-scrambling said ECC-decoded data into de-scrambled data.


1     28.    The method as recited in Claim 26, wherein the step of converting said

2    serialized data comprises:

3         generating a frame clock that is shifted in phase based upon said error

4    indications; and

5         converting said serialized data into said data frames using said frame clock.


1     29.    The method as recited in claim 26, wherein the step of converting said

2    serialized data comprises:

3         temporarily maintaining bits of said serialized data sufficient to form two or

4    more frames of parallel bits;

5        selecting a frame of data from said maintained bits based upon said error

6    indications, said frame of data being a frame of data in the data frames; and

7        repeating said steps of temporarily maintaining and selecting for generating

8    each data frame from said serialized data.

1    30.    The method as recited in claim 26, further comprising:

2        initially scrambling received data into scrambled data;

3        converting said scrambled data into ECC-encoded data; and

4        converting said ECC-encoded data into said serialized data.

1    31.    A serial communications method comprising:

2        converting data frames into ECC-decoded data and error indications; and

3        de-scrambling said ECC-decoded data into de-scrambled data.

1    32.    The method as recited in Claim 31, further comprising:

2        initially converting serialized data into said data frames as a function of said

3    error indications.

1    33.    The method as recited in claim 31, further comprising:

2        initially scrambling received data into scrambled data; and

3        performing an ECC encoding operation on said scrambled data to generate

4    said data frames.